

FACTORS INFLUENCING CUSTOMER CHOICE OF ELECTRIC VEHICLES IN THE WORLD

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Abstract

As the world faces environmental problems electric vehicles are being developed as an effective solution to problems such as a lack of fossil fuel issues and carbon dioxide emissions. Traditional transportation system has significantly increased environmental pollution. According to the International Energy Agency today vehicles consume around 60 million barrels of oil a day which is almost 70% of total production. Private vehicles consume around 36 million barrels per day which leads to 14 million tons of carbon dioxide (Sang and Bekhet, 2015). Therefore, replacing traditional vehicles with energy vehicles might be considered as a perspective solution (Tu and Yang 2019). Taking into account the importance of taking actions many authorities implemented positive policies to reduce environmental issues. Encouraging citizens to drive electric vehicles is being introduced in many countries.

Keywords: *electric vehicles, brand and diversity, positive influencing factors, negative influencing factors, driving range and charging infrastructure.*

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Introduction. As the world faces environmental problems electric vehicles are being developed as an effective solution to problems such as a lack of fossil fuel issues and carbon dioxide emissions. Traditional transportation system has significantly increased environmental pollution. According to the International Energy Agency today vehicles consume around 60 million barrels of oil a day which is almost 70% of total production. Private vehicles consume around 36 million barrels per day which leads to 14 million tons of carbon dioxide (Sang and Bekhet, 2015). Therefore, replacing traditional vehicles with energy vehicles might be considered as a perspective solution (Tu and Yang 2019). Taking into account the importance of taking actions many authorities implemented positive policies to reduce environmental issues. Encouraging citizens to drive electric vehicles is being introduced in many countries. Developed countries have been more dynamic in promoting electric vehicles and managed greatly to increase sales and usage of electric cars. Studies on consumer choice towards electric vehicles might be divided into two groups: economic and psychological. The following literature review focuses on analysis of previously done studies about main factors influencing customer choice of electric vehicles including economic and social factors such as purchase cost, charging infrastructure, governmental financial incentives. Additionally, conclusions whether these factors positively or negatively affect consumers' choices and willingness to buy electric vehicles would be provided.

Plakandaras et al. (2019) forecast air, road and train transportation demand for the U.S. domestic market based on econometric and machine learning methodologies, specifically, a Support Vector Regression (SVR) and from econometrics, the Least Absolute Shrinkage and Selection Operator and the Ordinary Least Squares regression. As a result of the study, they found that the transportation demand is influenced by fuel costs, except for road transportation where macroeconomic conditions affect transportation volumes only for specific forecasting horizons.

A new method of traffic flow forecasting based on quantum particle swarm optimization (QPSO) strategy for intelligent transportation system (ITS) was presented Zhang et al. (2020). They created a corresponding model based on the characteristics of the traffic flow data. Outcomes demonstrate that compared with other models, the proposed algorithm can diminish forecast errors and receive more stable prediction results.

Literature Review.

Negative Influencing factors:

1. Financial attributes.

Majority of reviewed studies stated that purchase price was the main factor which negatively impacted consumer choice. The fact that electric vehicles are much costly compared to conventional vehicles creates budget constraints and in this case consumers prefer conventional vehicles (Turrentine and Kurani, 2007). Several studies proved that there was a strong relationship with the income level of consumers. People with higher income levels were less price sensitive (Anchtnicht et al., 2012). Individuals who choose used cars were also price sensitive while consumers who were more engaged in practical aspects of the car rather than design were less affected by price. (Glerum et al., 2014).

2. Driving range and charging infrastructure.

Research which was conducted by Hidrue in 2011 states that driving range is a key attribute which impacts consumers choice and it has higher value for individuals compared to performance and pollution reduction attributes. The high driving range improves utility of consumers, which allows individuals to travel long distances. In case of electric vehicles driving range is too short to meet requirements of consumers willing to drive long distances which decreases consumers willingness to buy electric vehicles (Wang and Lui 2015). From another perspective long distance despite driving range relies on charging infrastructure. Before purchasing electric vehicles consumers will consider charge point locations and charge costs. With other words poor charging infrastructure would be considered as potential constraints for clients.

3. Brand and diversity.

The next factor which was discouraging potential customers from purchase and negatively affecting consumer decisions was brand and diversity. In 2015 Helveston found that individuals prefer different brands from certain countries and preferences vary across different countries. Additionally, it was proved by him that having more diversified electric vehicles models increases the probability of consumers choosing electric vehicles. Taking into account few brands' availability in the electric vehicles market some potential consumers would choose traditional vehicles instead of electric vehicles.

Positive influencing factors:

1. Governmental financial incentives and direct subsidies.

As was mentioned above, high purchase cost is one of the main factors which is negatively affecting consumer choice of electric vehicles and creating financial constraints in purchasing of this product. In 2015 Wang and Lui found in their study that governmental financial incentives can effectively decrease the purchase cost. By implementing financial incentives and direct subsidies some countries are trying to reduce financial constraints of electric vehicles purchase. Additionally, several studies proved that government financial incentives promote individual's adoption of electric vehicles (Wang and Lui., 2015). UK policy for direct subsidy might be a good example, since 2011 consumers who purchase new electric vehicles are receiving a one time bonus of 25% of the car up to a maximum 4,500 EUR. Most of the country's governments are trying to support the electric vehicle industry by providing subsidies and other financial incentives in order to stimulate electric car purchases and minimize emission. Generally, these kinds of actions are positively affecting consumer choice of electric vehicles and being applied in many European countries, USA, Japan and China.

2. Conveniences in home plug system.

One of the most demanded electric vehicles is the Plug-in hybrid electric vehicle(PHEV), because of their charging system. This system is called a home plug system, which has a significant effect on consumer choice (Moorhouse and Laufenberg, 2010). Apart from that, in the research conducted by Scarlet Allende(2019), which also analyzed the solar charging system in Chile. The results showed a significant role of this type of powering system, by promotion of solar powering system of electric cars, providing electricity for 10% of the national car fleet in Santiago. Finally, handling with electric vehicles did not cause any issues: figuring out how to utilize it, the convenience just as treatment of charging are totally evaluated decidedly and the rating further increment. (Schneider, Dütschke and Peters, 2014).

3. Eco-friendliness and individual environmental awareness.

One of the important factors of promoting electric cars worldwide is controlling air pollution, it has a huge Impact on customer choice to buy electric cars. Environmental protection becomes the most influential part of promoting electric vehicles, as research shows this factor overcomes energy saving. For this reason pollution should be considered as one of the factors, which impacts consumer choice of electric vehicles. The biggest advantage of an electric car is that these types of cars are eco-friendly, because they are run out by electrically powered engines. It does not have an influence on the environment, because electrically powered engines do not emit toxic gases or smoke and they are totally eco-friendly. Full electric vehicles are better than hybrid cars also. Hybrid cars run out on gas producing emission. Driving an electric car gives customers health and a green climate full of fresh air. As Axsen J. said the main idea of protection from pollution is recycling of used energy batteries, because it protects nature from pollution caused by discarded batteries(Axsen, 2012). In various studies individual environmental awareness was a potential factor which was positively affecting consumer choice of electric vehicles and role of eco-friendliness of electric vehicles was motivation to choose this type of vehicle for potential consumers.

Conclusion

In conclusion, the main findings were that the demand for electric vehicles can be influenced by various factors which can be considered as economic and social. Those factors were logically divided into positive and negative factors. From the economic perspective the main influencers were price and people's income. It was proved by several authors that high income earners would be less sensitive to the price changes in the car. However, the fact that electric cars cost significantly more than traditional ones creates a lot of constraints for buyers. As electric vehicles are only now being developed and used in the cities, their driving range is limited because of charging spots. Competition and variety of electric vehicles discourages buyers too. Although there were negative aspects, the other points such as vehicle type, eco-friendly machine, government's financial incentives and direct subsidies were significant advantages for purchase. . The main positive factor was machines being referred to as eco-friendly cars for its zero emissions of toxic gases. Based on our findings, the majority of researchers found above given factors as main influences on consumer choice. However there is a research gap in terms of other factors such as age and gender and almost no information was found about these factors. In our opinion, further analysis is needed in order to identify whether those factors positively or negatively influence consumer choice or have no significant effect on consumers' decisions.

Equality (2) shows that, other things being equal, *an increase in investment in the transport industry by 1% will lead to an increase in cargo turnover by 0.1%, and an increase in retail trade by 1% will lead to an increase in cargo turnover by 0.01%.*

In order to develop a competitive transport policy of the country using the methodological approaches adopted in developed countries to formulate strategic transport development programs, methodological principles and conceptual foundations of strategic planning for the development of the country's transport system have been developed. It is proposed to balance the strategies and programs of transport development with the strategies of socio-economic development of regions and resource-providing sectors, compliance with environmental norms and standards based on minimum social norms, as well as expand transit and export services, taking into account the benefits of the country's geopolitical position.

In order to study trends in the volume of shipment and arrival of goods and their possible future changes, as well as for indirect regulation of the development of transportation of the most massive goods in the region, it is recommended to use transport and economic balances more widely on the basis of territorial material balances, which serve as a macrological guideline for regulatory authorities and market entities when studying the dynamics of supply and demand for goods and groups of goods sold (Uldjabaev, Yarashova, 2017).

Thus, we can say that in the strategic planning of the development of transport companies, all its components are important and the chain of logistics processes should not be interrupted. And the higher the level of the planning object, the more detailed the system of forecasts of socio-economic, scientific, technical, and geopolitical development of transport should be presented in the projects, taking into account all relevant factors and trends.

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